REMARKS/ARGUMENTS

The Office Action dated August 12, 2004, and the references cited therein have been carefully reviewed in light of the Examiner's helpful comments and suggestions.

As a result of the Office Action, the specification is objected to on formal grounds, which objection has been addressed by the above amendment in a manner suggested by the Examiner. No new matter has been added.

Moreover, claim 3 has been amended to correct a minor typographical error. Also, by the above amendments, the multiple dependencies have been removed. And, claims 13 and 23 have been amended to correct the "temperature range" limitations, which are now supported by the specification.

Claims 9, 15, 16, and 18-20 are indicated to be allowable if rewritten in independent form, for which, as an initial matter, Applicants would like to thank the Examiner for such early indication of allowable subject matter. However, claims 1, 2, 10, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Rampley. And claims 1-3, 5, 6, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Akiyama. These references have been carefully reviewed but are not believed to show or suggest Applicants' invention as now claimed in any manner. Reconsideration and allowance of the pending claims is therefore respectfully requested in view of the following remarks.

By way of background, and as the Examiner is aware, a combustion method in which fuel and combustion air are separately and directly introduced into a combustion area and mixed therein, is known in the art. In this combustion method,

the fuel injected to the combustion area is diluted by in-furnace combustion gas entrained by the injected fuel, and the diluted fuel is mixed with the combustion air, which has been also diluted by the in-furnace combustion gas. However, "it is difficult in practice to surely control the mixing of these fluids", as described on page 4, line 18, of the specification, wherein "these fluids" refers to "fuel injection flow, combustion air flow and in-furnace circulation flow", as described on page 4, lines 14-15 of the specification.

Moreover, as described on page 6, lines 6-20 of the specification, "according to the arrangement of the present invention, the fuel is mixed with either or both of combustion gas extracted from a furnace and steam of steam supply means. The step of mixing the fuel with the combustion gas and/or steam, and the step of mixing the mixed fluid with combustion air are stepwisely carried out, and therefore, flexibility and reliability of mixing control of fuel, combustion air and combustion gas and/or steam are significantly improved. A large quantity of mixed fluid containing a thin fuel component is produced in the mixing area of the fuel and combustion gas and/or steam. The mixed fluid is fed to the combustion area, as being a large quantity of fuel gas flow having a momentum controllable independently of in-furnace combustion gas circulation flow. Accordingly, the fuel gas flow introduced into the furnace can mix with the combustion air flow without being substantially subject to influence of in-furnace combustion gas circulation flow. Thus, mixing process and mixing ratio of fuel and combustion gas can be variably controlled, independently of control of in-furnace combustion gas re-circulation flow."

Further, as defined in the amended claims 1 and 14, the combustion gas and/or steam is heated up to a high temperature equal to or higher than 700 deg. C and the fuel gas including such high temperature combustion gas and/or steam is introduced into the combustion area. The fuel gas "presents new combustion characteristics different from those of a conventional fuel" as described on page 7, lines 23-24 of the specification. This results from a reforming action of the hydrocabonaceous fuel by the high temperature steam, as described on page 11, lines 5-7 of the specification ("It is considered that steam contained in the combustion gas substantially affects such a reforming action of the hydrocabonaceous fuel.") The steam is supplied to the fuel by the combustion gas extracted from the furnace, or the steam is supplied to the fuel by the steam supply means.

According to MPEP 2131, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Claim 1 has been amended and it now requires "heating means for heating said combustion gas and/or steam up to a high temperature equal to or higher than 700 deg. C." Also, claim 14 has been amended and it now requires "said combustion gas and/or steam, or said mixed fluid, is heated up to a high temperature equal to or higher than 700 deg. C." Applicants respectfully submit that these limitations clearly distinguish claims 1 and 14 form the prior art.

Rampley teaches an apparatus wherein the combustion gas, after heating the subject (heat exchanger 122), is extracted out from the furnace and fed to the

manifold 144 under pressure by the fan or blower 136. In addition, the combustion gas extracted from the furnace is more or less cooled by heat loss. The combustion gas, thus cooled, is injected from a nozzle 146 so that the fuel and the combustion gas are mixed with each other by the injection pressure of the nozzle 146. The mixture of fuel and combustion gas is fed to the burner assembly 118 or its firing head 170, which is usually provided with means for ensuring stability of flame, as described on page 1 of the specification of the present application.

Moreover, the combustion gas at a relatively low temperature (usually, in a range of 200 deg. C ~ 300 deg. C is mixed with the fuel by the manifold 144. The mixture of fuel and combustion gas at a relatively low temperature is fed to the burner assembly, and it is mixed with the combustion air in the firing head 170.

However, the Rampley does not teach an apparatus having a heating means for heating the combustion gas or the mixture of fuel and combustion gas. Therefore, as far as Rampley is concerned, it is difficult to ensure a preferred ignition reliability or a preferred combustion stability, if the mixture (mixture of fuel and combustion gas) and the combustion air are directly fed to the combustion area, separately or independently. In addition, Rampley does not disclose nor suggest mixing of fuel and steam of steam supply means.

Now referring to the Akiyama reference, the Examiner has taken a position that "Akiyama et al discloses . . . a combustion area 12, a mixing means and mixing area (see drawing 3), a combustion gas extraction 6 . . .." *Office Action,* page 5.

However, Applicants respectfully disagree and traverse the rejection in view of the following remarks.

As illustrated in FIGS. 1, 2, and 5 of the Akiyama reference provided herewith in “Appendix A”, the flow of combustion air, fuel, steam and combustion gas are indicated by colored arrows. As best can be seen, a burner throat area is indicated by blue color. The burner throat is also called "burner tile", in this technical field.

The burner throat functions to simultaneously mix the air, fuel, steam and combustion gas. This area also acts to stabilize the flame made by combustion reaction of the air and fuel, like a flame stabilizer as described on page 1 of the specification of the present application.

In FIG. 2, the burner throat functions to mix the air, steam and combustion gas, whereas the fuel is directly injected to the combustion area 12.

As stated in the Office Action, the Examiner compares the gas flowing through the passage 6 of Akiyama with the "combustion gas extracted from a furnace" as in claim 1 of this application. In the arrangement of FIGS. 1 and 5, however, the combustion reaction of the fuel and air is initiated or started inside of the burner throat by mixing the fuel and air within the burner throat. Therefore, this arrangement differs from the arrangement in claim 1 of the present application. In the present invention, the fuel of the fuel feeding means and the combustion gas extracted from a furnace and/or steam of steam supply means are mixed with each other by the mixing means, and then, the fuel gas (mixture) is further mixed, in the combustion area, with the combustion air supplied to the combustion area by the

combustion air supply means. Therefore, in the present invention, the combustion reaction is initiated or started in the combustion area.

In the arrangement of FIG. 2 of Akiyama, the combustion reaction is initiated or started in the combustion area, similarly to the present invention. However, in the arrangement of FIG. 2, the fuel is fed to the combustion area 12 by the nozzle 9 and the gas fed to the combustion area from the burner throat is the mixture of air, combustion gas and steam, which is not the mixture of the fuel and the combustion gas and/or steam as in the present invention. Therefore, the arrangement in FIG. 2 of Akiyama differs from the arrangement recited in claim 1 of the present application. In the present invention, the mixture of "said fuel and said combustion gas and/or steam" is fed to the combustion area. Therefore, in view of foregoing, Applicants respectfully request Section 102(b) anticipation rejections by Rampley and Akiyama be withdrawn.

New claims 42 through 45 have been added. New claim 42 is of substantially the same scope as claim but recites a "steam heating means" instead of "heating means." Therefore, claim 42 is believed to be allowable for the same reasons as claim 1.

The prior art references made of record by the Examiner have each been considered but are not believed to obviate against the allowability of the claims as amended. It is noted that none of these references has been specifically applied by the Examiner against any of the original claims.

Each issue raised in the Office Action dated August 12, 2004, has been

addressed and it is believed that claims 1-3, 5-6, 8-16, 18-29, 38, and 42-45 are in condition for allowance. Wherefore, Applicants respectfully request a timely Notice of Allowance be issued in this case.

Respectfully submitted,
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